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PRICE $2.00

CONDENSED

HEATH COMPANY, BENTON HARBOR, MICHIGAN

HEATHKIT®
ASSEMBLY MANUAL

HEATHKIT

SOLID-STATE COMBO AMPLIFIER
MODEL TA-17

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Assembly
and
Operation
of the
HEATHKIT

SOLID-STATE COMBO AMPLIFIER

Model TA-17

HEATH COMPANY
BENTON HARBOR, MICHIGAN

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INTRODUCTION

The Heathkit Model TA-17 Solid-State Combo Amplifier is especially designed for use with high quality electric guitars to provide the features most wanted by modern guitarists. The amplifier also provides high-quality sound when used with accordions, portable organs and pianos, and other musical instruments equipped with electrical pickups.

Three solid-state amplifier channels are provided. These three channels, Guitar, Mic-Phono, and Bass, offer a total of six inputs to accomodate almost every combo or band.

The Guitar (special effects) channel has two inputs and features reverberation, tremolo and harmonic modifier (H-M). Reverberation intensity, and the rate and depth of the tremolo are adjustable. Foot switches provide hands-free on-off control of the reverberation and tremolo. The H-M switch provides the popular "fuzzy" effect desired by many modern guitarists.

The Mic-Phono channel has both a Microphone and a Phono input, and Volume, Bass, and Treble controls. This channel can be used to add vocal accompaniment or announcements without the use of additional public address equipment. Instruments and special effects equipment having low output levels can also be used. The Phono input can be used for background music or for fill-in music for breaks.

The special Bass channel has Volume and Tone controls, and two inputs. This channel is especially suited for bass guitars and other instruments where low-frequency tones are important.

All controls and inputs are on the control panel of the Amplifier. Storage space for the line cord, speaker cable, and guitar cable is located behind the snap-off cabinet back panel. The black, leather-textured cabinet is both durable and attractive. Handles are provided on the cabinet for carrying convenience.

Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

PARTS LIST

The numbers in parentheses in the Parts List are keyed to the numbers on the Parts Pictorial (fold-out from Pages 2 and 7).

RESISTORS

1/2 Watt

PART No.	PARTS Per Kit	DESCRIPTION
(1) 1-54	2 ✓	15 Ω 5%(brown-green-black)
1-49	1 ✓	22 Ω (red-red-black)
1-1	2 ✓	47 Ω (yellow-violet-black)
1-3	3 ✓	100 Ω (brown-black-brown)
1-45	1 ✓	220 Ω (red-red-brown)
1-4	1 ✓	330 Ω (orange-orange-brown)
1-6	1 ✓	470 Ω (yellow-violet-brown)
1-119	1 ✓	560 Ω (green-blue-brown)
1-7	1 ✓	680 Ω (blue-gray-brown)
1-8	1 ✓	820 Ω (gray-red-brown)
1-9	3 ✓	1000 Ω (brown-black-red)
1-80	1 ✓	1200 Ω 5% (brown-red-red)
1-11	1 ✓	1500 Ω (brown-green-red)
1-44	2 ✓	2200 Ω (red-red-red)
1-13	2 ✓	2700 Ω (red-violet-red)
1-14	2 ✓	3300 Ω (orange-orange-red)
1-46	1 ✓	3900 Ω (orange-white-red)
1-16	6 ✓	4700 Ω (yellow-violet-red)
1-19	6 ✓	6800 Ω (blue-gray-red)
1-73	3 ✓	8200 Ω (gray-red-red)
1-20	2 ✓	10 KΩ (brown-black-orange)
1-21	2 ✓	15 KΩ (brown-green-orange)
1-69	1 ✓	18 KΩ (brown-gray-orange)
1-22	4 ✓	22 KΩ (red-red-orange)
1-24	1 ✓	33 KΩ (orange-orange-orange)
1-67	1 ✓	39 KΩ (orange-white-orange)
1-25	4 ✓	47 KΩ (yellow-violet-orange)
1-102	1 ✓	82 KΩ (gray-red-orange)
1-26	2 ✓	100 KΩ (brown-black-yellow)
1-27	3 ✓	150 KΩ (brown-green-yellow)
1-126	1 ✓	180 KΩ (brown-gray-yellow)
1-29	2 ✓	220 KΩ (red-red-yellow)
1-30	1 ✓	270 KΩ (red-violet-yellow)
1-33	1 ✓	470 KΩ (yellow-violet-yellow)
1-35	1 ✓	1 megohm (brown-black-green)
1-37	1 ✓	2.2 megohm (red-red-green)

1/2 Watt 5% Low-Noise

PART No.	PARTS Per Kit	DESCRIPTION
(2) 4-15	1 ✓	1000 Ω (brown-black-red)
4-39	6 ✓	12 KΩ (brown-red-orange)
4-23	2 ✓	22 KΩ (red-red-orange)
4-24	1 ✓	24 KΩ (red-yellow-orange)
4-25	3 ✓	27 KΩ (red-violet-orange)
4-26	3 ✓	33 KΩ (orange-orange-orange)
4-27	1 ✓	47 KΩ (yellow-violet-orange)
4-30	1 ✓	270 KΩ (red-violet-yellow)
4-31	1 ✓	330 KΩ (orange-orange-yellow)
4-49	1 ✓	560 KΩ (green-blue-yellow)
4-50	1 ✓	680 KΩ (blue-gray-yellow)
4-51	4 ✓	820 KΩ (gray-red-yellow)
4-46	1 ✓	1.5 megohm (brown-green-green)

1 Watt

PART No.	PARTS Per Kit	DESCRIPTION
(3) 1-13-1	1 ✓	22 Ω (red-red-black)
1-1-1	1 ✓	470 Ω (yellow-violet-brown)
1-21-1	2 ✓	680 Ω (blue-gray-brown)

2 Watt

PART No.	PARTS Per Kit	DESCRIPTION
(4) 1-15-2	1 ✓	1000 Ω (brown-black-red)
1-2-2	1 ✓	4700 Ω (yellow-violet-red)

5 Watt

PART No.	PARTS Per Kit	DESCRIPTION
(5) 3-11-5	2 ✓	.33 Ω wire-wound

CAPACITORS

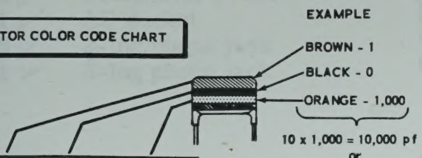
Disc

PART No.	PARTS Per Kit	DESCRIPTION
(6) 21-54	1 ✓	75 pf
21-75	1 ✓	100 pf
21-14	4 ✓	.001 μfd
21-26	1 ✓	.003 μfd
21-47	4 ✓	.01 μfd, 50 V
(7) 21-70	2 ✓	.01 μfd, 1.4 KV

Resin

NOTE: The resin capacitors may be color coded, or the value may be printed on them. If necessary, refer to the capacitor color code chart and example to help identify these capacitors.

MYLAR CAPACITOR COLOR CODE CHART



COLOR	1ST DIGIT	2ND DIGIT	MULTIPLIER
BLACK	0	0	1
BROWN	1	1	10
RED	2	2	100
ORANGE	3	3	1,000
YELLOW	4	4	10,000
GREEN	5	5	100,000
BLUE	6	6	1,000,000
VIOLET	7	7	10,000,000
GRAY	8	8	100,000,000
WHITE	9	9	1,000,000,000

PART No.	PARTS Per Kit	DESCRIPTION
(8) 27-63	2 ✓	.022 μfd, (wide red band-orange) 50 V minimum
(9) 27-27	1 ✓	.022 μfd, (wide red band-orange) 400 V
27-47	3 ✓	.1 μfd or .1 K (brown-black-yellow)
27-60	6 ✓	.22 (0.22) μfd (wide red band-yellow)
27-61	4 ✓	.47 μfd (yellow-violet-yellow)

Tubular

PART No.	PARTS Per Kit	DESCRIPTION
(10) 23-42	1 ✓	.015 μfd

Electrolytic

PART No.	PARTS Per Kit	DESCRIPTION
(11) 25-123	2 ✓	2 μfd, 25 V
(12) 25-115	11 ✓	10 μfd, 15 V
(13) 25-126	1 ✓	50 μfd, 50 V
(14) 25-117	2 ✓	100 μfd, 15 V
(15) 25-153	1 ✓	100 μfd, 3 V
(16) 25-28	1 ✓	100 μfd, 50 V
(17) 25-172	1 ✓	100 μfd, 70 V
(18) 25-131	1 ✓	250 μfd, 25 V
(19) 25-173	1 ✓	500 μfd, 75 V
(20) 25-156	1 ✓	4000 μfd, 50 V
(21) 25-171	1 ✓	8000 μfd, 90 V

DIODES

PART No.	PARTS Per Kit	DESCRIPTION
(22) 56-26	2 missing	1N191 crystal (brown-white-brown)
(23) 56-32	1 ✓	Zener, 13.5 V
(24) 56-44	2 ✓	Zener, 4.7 V
(25) 56-33	2 ✓	1N3754, temperature compensating
(26) 57-27	2 ✓	Silicon, 750 ma
(27) 57-42	4 ✓	Silicon, 3 ampere

TRANSISTORS

NOTE: The following transistors may be marked with either the part number or type number.

PART No.	PARTS Per Kit	DESCRIPTION
(28) 417-132	4 ✓	MPS 6517
(29) 417-91	5 ✓	2N3391
417-118	5 ✓	2N3393
417-135	2 ✓	2N3859A
(30) 417-137	2 ✓	40409
417-138	1 ✓	40410
(31) 417-139	2 ✓	40411

CONTROLS-SWITCHES

PART No.	PARTS Per Kit	DESCRIPTION
(32) 10-8	1 ✓	10 KΩ control
10-110	4 ✓	10 KΩ control
10-10	2 ✓	20 KΩ control
10-40	2 ✓	100 KΩ control
(33) 12-85	2 ✓	50 KΩ dual control
(34) 60-32	4 ✓	Rocker switch
(35) 64-25	2 ✓	Pushbutton switch
(36) 61-12	1 ✓	3-position toggle switch

TERMINAL STRIPS

PART No.	PARTS Per Kit	DESCRIPTION
(37) 431-1	1 ✓	2-lug vertical
(38) 431-43	1 ✓	3-lug large
(39) 431-39	1 ✓	5-lug miniature
(40) 431-42	1 ✓	5-lug large
(41) 431-45	1 ✓	6-lug

INSULATORS

PART No.	PARTS Per Kit	DESCRIPTION
(42) 73-4	2 ✓	5/16" rubber grommet
73-1	1 ✓	3/8" rubber grommet
73-2	2 ✓	3/4" rubber grommet
(43) 75-71	1 ✓	Strain relief (with small slot)
75-30	1 ✓	Strain relief (with large slot)
(44) 75-85	6 ✓	Nylon spacer
(45) 75-60	2 ✓	Mica insulator (packed between two pieces of cardboard)
73-50	1 ✓	Plastic sponge strip
(46) 73-49	1 ✓	Rubber pad
333-5	1 ✓	Plastic edge molding

PART No.	PARTS Per Kit	DESCRIPTION

PLUGS-SOCKETS-JACKS

(47) 438-4	2 ✓	Phono plug
(48) 438-27	1 ✓	Phone plug
(49) 432-29	2 ✓	Speaker plug
(50) 432-32	2 ✓	Speaker socket
(51) 434-107	1 ✓	Phono socket
(52) 434-175	1 ✓	Lamp socket
(53) 434-117	2 ✓	Transistor socket
(54) 434-147	1 ✓	AC socket
(55) 436-20	5 ✓	2-lug phone jack
(56) 436-27	1 ✓	3-lug phone jack

GENERAL

(57) 9-18	1 ✓	Light sensitive resistor
(58) 45-59	1 ✓	8.8 μH choke
(59) 65-11	1 ✓	2.11 ampere circuit breaker
412-1	1 ✓	#47 lamp
462-262	11 ✓	Knob

WIRE-CABLE-SLEEVING

134-168	1 ✓	Control cable assembly
134-169	1 ✓	Amplifier-power supply cable assembly
344-15	1	Black stranded wire
344-16	1	Red stranded wire
344-50	1	Black hookup wire
344-51	1	Brown hookup wire
344-52	1	Red hookup wire
344-53	1	Orange hookup wire
344-54	1	Yellow hookup wire
344-55	1	Green hookup wire
344-56	1	Blue hookup wire
344-57	1	Violet hookup wire
344-58	1 ✓	Gray hookup wire
344-59	1 ✓	White hookup wire
346-1	1 ✓	Sleeving
343-7	1 ✓	1-lead shielded cable
347-35	1 ✓	2-lead shielded cable
89-33	1 ✓	Line cord

PART No.	PARTS Per Kit	DESCRIPTION

HARDWARE

#2 Hardware

(60) 250-212	5 ✓	2-56 x 3/16" self-tapping screw

#4 Hardware

(61) 250-4	1 ✓	4-40 x 3/8" roundhead screw
(62) 250-52	8 ✓	4-40 x 1/4" screw
(63) 252-2	1 ✓	4-40 nut
(64) 254-9	2 ✓	#4 lockwasher

#6 Hardware

(65) 250-56	8 ✓	6-32 x 1/4" screw
(66) 250-89	28 ✓	6-32 x 3/8" screw
(67) 250-26	5 ✓	6-32 x 5/8" screw
(68) 250-298	6 ✓	6-32 x 3/4" self-tapping screw
(69) 250-8	10 ✓	#6 x 3/8" sheet metal screw
(70) 252-3	40 ✓	6-32 nut
(71) 254-1	44 ✓	#6 lockwasher

#8 Hardware

(72) 250-15	12 ✓	8-32 x 1/8" setscrew
(73) 250-97	5 ✓	8-32 x 1" truss head screw
(74) 252-4	4 ✓	8-32 nut
(75) 252-92	5 ✓	8-32 self-retaining nut
(76) 254-2	4 ✓	#8 lockwasher
(77) 253-45	5 ✓	#8 flat washer

Other Hardware

(78) 252-7	17 ✓	Control nut
(79) 254-14	1 ✓	1/4" lockwasher (inside diameter)
(80) 253-10	6 ✓	3/8" control flat washer
(81) 253-30	1 ✓	1/2" flat washer (inside diameter)
(82) 254-4	9 ✓	Large control lockwasher
(83) 254-5	6 ✓	Small control lockwasher
(84) 432-67	1 ✓	Wire nut

PART No.	PARTS Per Kit	DESCRIPTION
METAL PARTS		
(85) 200-498	1 ✓	Power supply chassis
(86) 200-499	1 ✓	Amplifier chassis
(87) 203-496	1 ✓	Front panel
(88) 203-495	1 ✓	Center panel
(89) 202-65	1 ✓	Right panel
(90) 202-66	1 ✓	Left panel
(91) 202-67	1 ✓	Rear panel
(92) 214-61	1 ✓	Reverberation panel
(93) 204-790	1 ✓	Switch bracket
(94) 206-353	1 ✓	Input shield
(95) 204-789	2 ✓	Front panel support bracket
(96) 204-791	1 ✓	Chassis support bracket
(97) 207-56	1 ✓	Capacitor mounting clamp
(98) 100-589	1 ✓	Capacitor mounting strap
(99) 214-46-1	1	Foot switch housing
(100) 205-536-1	1 ✓	Foot switch plate
(101) 215-23	2 ✓	Transistor heat sink

PART No.	PARTS Per Kit	DESCRIPTION
MISCELLANEOUS		
91-163	1 ✓	Guitar amplifier cabinet, with two clips and two screws in an envelope stapled to the back cover
150-10	1 ✓	Reverberation unit
85-188-1	1 ✓	Circuit board
54-181	1 ✓	Power transformer
331-6	✓	Solder
(102) 352-13	1 ✓	Silicone grease
(103) 390-183	1 ✓	Foot switch label
391-34	1 ✓	Blue and white identification label
597-308	1 ✓	Kit Builders Guide
597-260	1 ✓	Parts Order Form
(104) 490-5	1 ✓	Nut starter
595-903	1 ✓	Manual

STEP-BY-STEP ASSEMBLY

Before starting to assemble this kit, read the Kit Builders Guide for complete information on wiring, soldering, and step-by-step assembly procedures.

CIRCUIT BOARD ASSEMBLY

Refer to the Circuit Board Parts Mounting and Soldering sections (Pages 11, 12, and 13) of the Kit Builders Guide before starting the circuit board assembly.

Resistors will be called out by the resistance value (in Ω or KΩ) and color code. Use 1/2 watt resistors unless directed otherwise in a step.

Capacitors will be called out by the capacitance value (in pf or μfd) and type (disc, resin, or electrolytic).

Arrange the circuit board in the position shown before you begin the steps on each Pictorial. Then complete each of the steps.

Perform the steps on Pictorial 1-1 through 1-9.

SPEAKERS

HEATHKIT TA-17-1 COMBO SPEAKER SYSTEM

The Heathkit Combo Speaker System, Model TA-17-1, is designed for use with the TA-17 Amplifier. You can use either one or two TA-17-1 Speaker Systems by simply using the convenient plug-in connectors on the rear panel of the TA-17 Amplifier. Additional information is provided in the TA-17-1 Manual.

( ) Refer to Figure 3 and connect the speaker wires to the speaker plugs supplied.

OTHER SPEAKERS

If you use speakers other than the Heathkit Combo Speaker System, you must be careful to make proper speaker connections to the TA-17 Amplifier. It will be necessary for you to know the "impedance", "power rating," and "phasing" of the speaker or speakers you use. These three terms are described below for your convenience:

IMPEDANCE restricts the flow of electric current. The unit of measurement for impedance is Ω (ohms). Most speakers have an impedance of either 4Ω, 8Ω, or 16Ω. See Parts A, B, and C, of Figure 4 (fold-out from Page 52).

When you connect two speakers in parallel, the result is less total impedance. Parallel speaker connections are shown in Parts D, E, and F of Figure 4. For example, if you connect two 8 Ω speakers in parallel, (Part D of Figure 4) the resulting total impedance will be 4 Ω; if you connect two 16 Ω speakers in parallel, (Part F) the resulting total impedance will be 8 Ω.

POWER RATING is the amount of audio power a speaker can handle without being damaged. Power is measured in watts. Many speakers are rated up to 100 watts and more, while others have a much lower power rating.

PHASING. When two or more speakers are used, they should be connected so they are "in-phase." "In-phase" means that both speaker cones move in the same direction at the same time, when driven by identical signals. (If multiple-speaker systems are used, phasing refers to the low-frequency speaker in each system.)

1. DISASSEMBLE SPEAKER PLUG.
2. CONNECT SPEAKER WIRES.
   NOTE: MAKE SURE THE MARKED WIRE FROM LUG 1 OF THE SPEAKER SOCKET IS CONNECTED TO THE MARKED LUG ON THE SPEAKER.
3. REASSEMBLE SPEAKER PLUG.

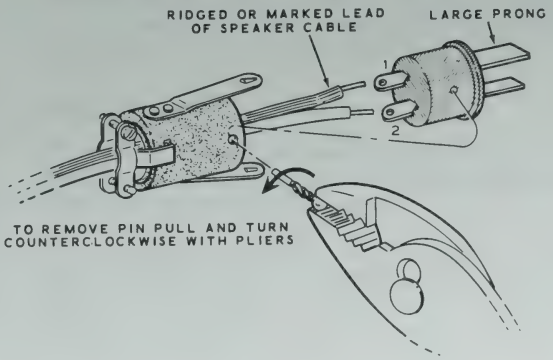

RIDGED OR MARKED LEAD OF SPEAKER CABLE
LARGE PRONG
1
2
TO REMOVE PIN PULL AND TURN COUNTERCLOCKWISE WITH PLIERS

FIGURE 3

If you use just a single speaker with the TA-17 Amplifier, it is only necessary to connect the two speaker leads to one of the 2-pin connectors supplied, and then plug the connector into either socket on the rear of the Amplifier. Make sure the power rating of the speaker is adequate. See Parts A, B, and C of Figure 4. The impedance of the speaker should be between 4 Ω and 16 Ω.

If you use more than one speaker with the TA-17 Amplifier, you should make sure their combined power rating is not exceeded and that they are connected in-phase. See Parts D and E of Figure 4.

The two output sockets are connected in parallel inside the Amplifier, so you can connect one speaker to one socket and another speaker to the other socket. The total parallel impedance should be between 4 Ω and 16 Ω. See Part F of Figure 4. NOTE: Speakers should not be connected in series for use with the TA-17 Amplifier.

OPERATION

CONTROL EXPLANATION

Before proceeding to the following explanation of each Amplifier channel, study Figure 5 to become more familiar with the function of the controls, switches, jacks, and sockets.

GUITAR CHANNEL

The GUITAR channel is used for solo or lead instruments. A wide variety of musical effects can be obtained with different settings of the controls and switches in this channel.

The VOLUME, BASS, TREBLE, RATE, DEPTH, and REVERB controls and the BRIGHTNESS and H-M switches effect only the instruments connected to the GUITAR INPUT jacks.

Foot Switch Jack

When the foot switch is plugged into this jack, the TREMOLO and REVERB circuits can be switched on or off by using the TREM and REV foot switches. This enables you to preset the TREM and REV controls on the Amplifier.

MIC-PHONO CHANNEL

The MIC-PHONO channel is used primarily for microphones and phonographs. It has its own VOLUME, BASS and TREBLE controls and a MIC-PHONO switch. This switch connects either the MIC jack or the PHONO socket to the amplifier input.

Microphone

A high impedance dynamic microphone (5000 Ω to 80,000 Ω) is the best type of microphone to use with this amplifier. A low impedance dynamic microphone (50 Ω to 200 Ω) can also be used, however, it may not have sufficient output to obtain full power from the Amplifier. If you experience any problems (a loud squeal) when using a microphone, refer to the section on Acoustic Feedback on Page 58.

Phonograph

A phonograph equipped with a magnetic cartridge is the type to use with this Amplifier. However, a phonograph with a crystal cartridge can be used if a 1.5 megohm to 3.3 megohm resistor is connected in series with the cartridge.

BASS CHANNEL

The BASS channel is used primarily for bass guitars. Electronic guitars and accompaniment instruments can also be used.

The VOLUME and TONE controls and the BASS BOOST switch effect only the instruments connected to the BASS INPUTS. When the BASS BOOST switch is turned ON, it gives you additional bass without adjusting the TONE control.

OPERATING PROCEDURE

This procedure will illustrate the use of the controls and switches in the GUITAR channel only.

CAUTION: This Amplifier is capable of very intense sound levels. We recommend that all of the VOLUME controls and the REVERB control be turned full counterclockwise before turning the Amplifier on. Also, be very careful not to jar the Amplifier while the REVERB control is turned up.

1. Turn all of the Amplifier controls full counterclockwise.
2. Place all of the switches in the OFF position. The MIC-PHONO switch can be in either the MIC or PHONO position.
3. Plug the speaker cord into the Amplifier speaker socket.
4. Plug the line cord into an AC outlet.
5. Plug the instrument into either GUITAR INPUT jack.

VOLUME: Turn clockwise to increase the volume from the GUITAR channel.

BASS: Turn clockwise from position 5 to increase the bass and counterclockwise to decrease the bass.

TREBLE: Turn clockwise from position 5 to increase the treble and counterclockwise to decrease the treble.

TREMOLO RATE: Turn clockwise to increase the tremolo rate (speed of pulsating effect) and counterclockwise to decrease the rate.

TREMOLO DEPTH: Clockwise from position 0 to turn on the tremolo (pulsating effect). Full counterclockwise will turn off the tremolo.

REVERB: Turn clockwise to increase the amount of reverberation (echo effect) and counterclockwise to decrease it.

VOLUME: Turn clockwise to increase the volume from the MIC-PHONO channel.

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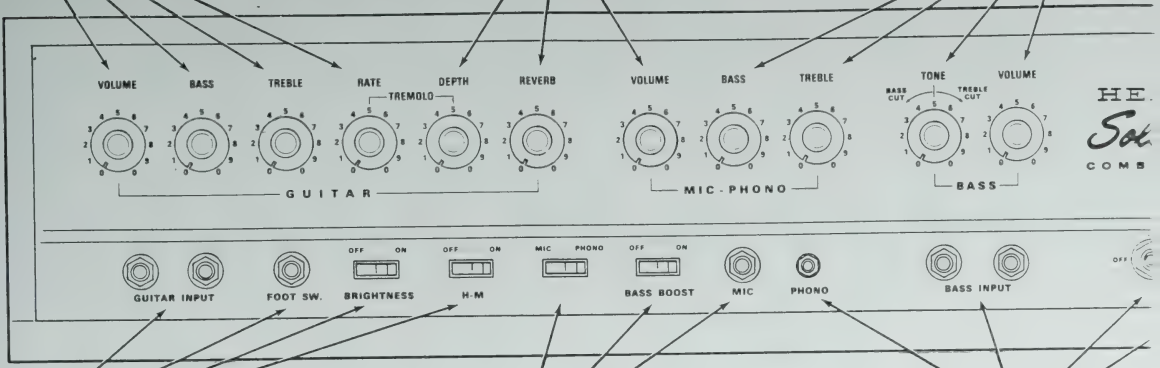

H-M (harmonic modifier): When turned ON, the music has a "fuzzy effect." It is most effective on bass notes that are played individually.

BRIGHTNESS: When turned ON, the volume of the higher frequency notes are increased adding "presence" to the music.

FOOT SW Jack: For foot switch. Used to turn the reverb and/or tremolo on or off without having to turn the TREMOLO and REVERB controls.

GUITAR INPUT: These jacks are used to plug in solo or lead instruments.

MIC Jack: Used for microphone input.

BASS BOOST: When turned ON, the bass becomes louder in the BASS channel only.

MIC-PHONO Switch: When a microphone is used switch to MIC. When a phonograph is used switch to PHONO. Only one can be used at a time.

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VOLUME: Turn clockwise to increase the volume from the GUITAR channel.

BASS: Turn clockwise from position 5 to increase the bass and counterclockwise to decrease the bass.

TREBLE: Turn clockwise from position 5 to increase the treble and counterclockwise to decrease the treble.

TREMOLO RATE: Turn clockwise to increase the tremolo rate (speed of pulsating effect) and counterclockwise to decrease the rate.

TREMOLO DEPTH: Clockwise from position 0 to turn on the tremolo (pulsating effect). Full counterclockwise will turn off the tremolo.

REVERB: Turn clockwise to increase the amount of reverberation (echo effect) and counterclockwise to decrease it.

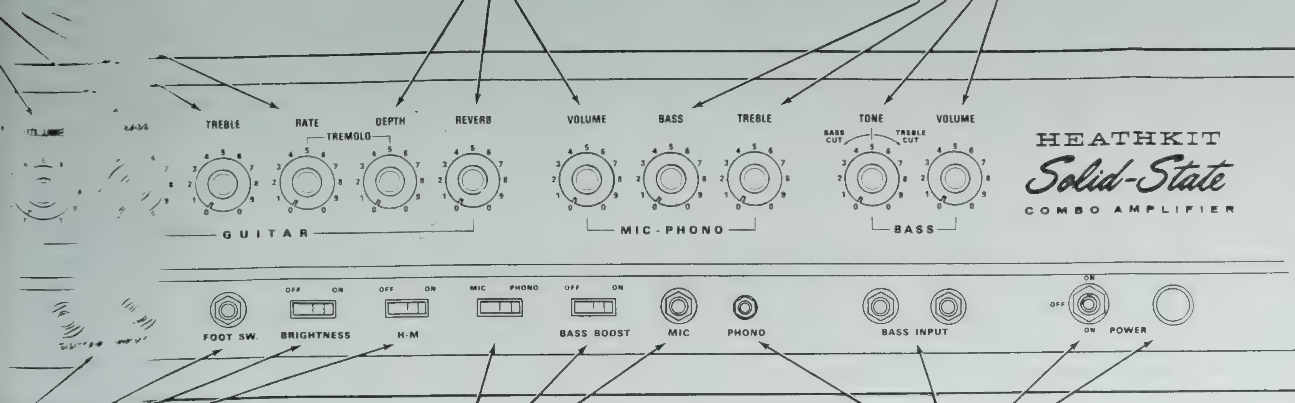
VOLUME: Turn clockwise to increase the volume from the MIC-PHONO channel.

BASS: Turn clockwise from position 5 to increase the bass and counterclockwise to decrease the bass.

TREBLE: Turn clockwise from position 5 to increase the treble and counterclockwise to decrease the treble.

TONE: Turn clockwise from position 5 to decrease the treble. Turn counterclockwise from 5 to decrease the bass.

VOLUME: Turn clockwise to increase the volume from the BASS channel.



H-M (harmonic modifier): When [illegible] ON, the music has a "[illegible] effect." It is most effective on bass notes that are played individually.

BRIGHTNESS: When turned ON, the volume of the higher frequency notes are increased adding "presence" to the music.

FOOT SW Jack: For foot switch, used to turn the reverb and/or tremolo on or off without having [illegible] the TREMOLO and REVERB controls.

GUITAR INPUT: These jacks are used to plug in solo or lead instruments.

MIC Jack: Used for microphone input.

BASS BOOST: When turned ON, the bass becomes louder in the BASS channel only.

MIC-PHONO Switch: When a microphone is used switch to MIC. When a phonograph is used switch to PHONO. Only one can be used at a time.

POWER lamp: The lamp comes on when the POWER switch is turned ON.

POWER switch: Turns Amplifier ON or OFF. Use the ON position that results in the least amount of hum.

BASS INPUT: These jacks are used primarily for bass guitars. Other guitars and accompaniment instruments, however, can also be plugged in here.

PHONO Socket: Used for phonograph input.

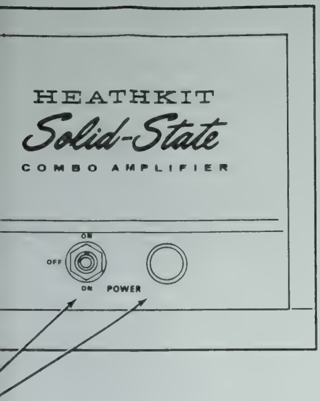
FIGURE 5

BASS: Turn clockwise from position 5 to increase the bass and counterclockwise to decrease the bass.

TREBLE: Turn clockwise from position 5 to increase the treble and counterclockwise to decrease the treble.

TONE: Turn clockwise from position 5 to decrease the treble. Turn counterclockwise from 5 to decrease the bass.

VOLUME: Turn clockwise to increase the volume from the BASS channel.



POWER lamp: The lamp comes on when the POWER switch is turned ON.

POWER switch: Turns Amplifier ON or OFF. Use the ON position that results in the least amount of hum.

BASS INPUT: These jacks are used primarily for bass guitars. Other guitars and accompaniment instruments, however, can also be plugged in here.

PHONO Socket: Used for phonograph input.

SPEAKER Sockets: Either or both sockets can be used since they are wired in parallel. The total speaker impedance should not be less than 4 Ω.

CIRCUIT BREAKER: A device to protect the amplifier circuitry. To reset the circuit breaker push in on the red button.

AC Socket: Can be used as a power source for accessories such as a tape recorder, record player, echo unit, public address system, another amplifier, etc.

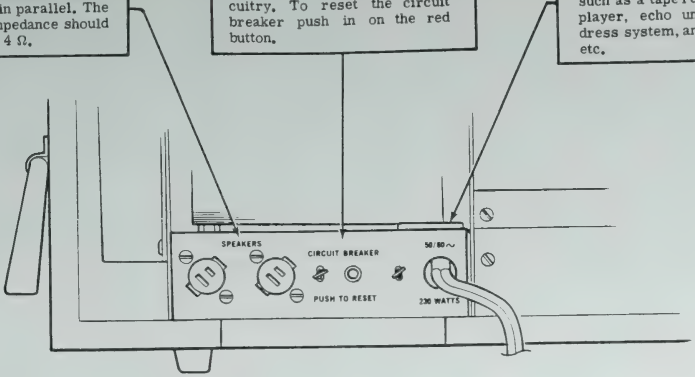


FIGURE 5

6. Place the POWER switch in one of the ON positions. Always use the ON position that gives the least amount of hum from the speakers.

7. Turn the Volume and Tone control of the instrument to between 1/2 and 3/4 of its full clockwise position.

8. Turn the VOLUME control of the Amplifier to the desired listening level while playing the instrument.

9. Turn the BASS and TREBLE controls to obtain the desired tone.

10. Turn the DEPTH and RATE controls to obtain the desired tremolo.

11. Turn the BRIGHTNESS switch ON to bring more brightness or presence to the music.

12. Turn the H-M switch ON to obtain the popular "fuzzy" effect. Many unusual sounds can be created by using this switch with various control settings.

ACOUSTIC FEEDBACK

Acoustic feedback occurs when vibrations (sound waves) from the speakers are picked up by the Guitar or microphone, or by the delay springs in the reverberation unit. These vibrations are converted into electrical signals and reamplified; the result is a loud, continuous squeal or hum.

Acoustic feedback is more likely to occur when using the Guitar Amplifier in rooms that are small, with a low ceiling, and hard walls. Another condition that causes acoustic feedback is placing the guitar or microphone too near the speaker cabinet.

Usually, acoustic feedback can be corrected by changing the placement of the guitar or microphone. However, some situations will require a lower Volume setting to eliminate the problem. At high REVERB settings, you may also encounter mechanical feedback directly from the speakers, through the Amplifier cabinet, to the springs in the reverberation unit. If this occurs, use a lower setting of the REVERB control or remove the Amplifier from the top of the speaker cabinet.

IN CASE OF DIFFICULTY

NOTE: Refer to the Kit Builders Guide for Service and Warranty information. Refer to the X-Ray View (fold-out from Page 63) and the Chassis Photographs on Pages 68 and 69 for the physical location of parts.

This section of the Manual is divided into the following sections: General Checks, Testing Precautions, The Circuit Breaker, Shipping Instructions and Troubleshooting Chart. The General Checks describe what you could do about the type of difficulty that may occur after the amplifier is assembled. The next section describes some precautions to observe when making tests, and the Circuit Breaker section tells you what to do if a circuit breaker opens.

The Troubleshooting Chart lists some actual difficulties that could occur, and tells what could cause these difficulties. Before you try to locate the cause of a difficulty, be sure you are operating the controls correctly. See the Operation section on Page 57.

CAUTION: The power transformer, AC socket, circuit breaker, and the POWER switch all have AC line voltage applied to them. Use caution when testing to avoid electrical shock.

GENERAL CHECKS

The following general checks should be made if the Amplifier does not operate properly after it is assembled.

1. Recheck the wiring. Trace each lead in colored pencil on the Pictorials as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something consistently overlooked by the builder.

2. About 90% of the kits that are returned for repair do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure that they are soldered as described in the Soldering section of the Kit Builders Guide.

3. Check to be sure that all transistors are in their proper locations. Make sure the pilot lamp lights up.

4. Check the values of the parts. Be sure that the proper part has been wired into the circuit, as shown in the Pictorial diagrams and called out in the wiring instructions. It is sometimes easy to misread the third color band on a resistor. For example, if a 3300 Ω (orange-orange-red) resistor were installed instead of a 33 KΩ (orange-orange-orange) resistor, the circuit would not operate properly.

5. Check for bits of solder, wire ends or other foreign matter which may be lodged in the wiring and for solder that may be bridged across the circuit board foils.

6. If, after visual checks, the trouble is still not located and a voltmeter is available, check voltage readings against those shown on the Voltage Drawing (fold-out from Page 70) and the Schematic diagram (fold-out from Page 69). NOTE: All voltage readings were taken with an 11 megohm input vacuum tube voltmeter. Voltages may vary as much as ±20%.

7. A review of the Circuit Description may also prove helpful in indicating where to look for trouble.

TESTING PRECAUTIONS

When testing the amplifier, make certain the speaker leads are not short circuited, as this could damage the output transistors or other circuit components in the amplifier. When making voltage measurements, be careful that you do not short across adjacent foils on the circuit board, or between two terminals, or from a terminal to ground. For instance, if the voltmeter test probe should slip and short out a bias voltage or voltage supply point in the power output stage, it is almost certain to damage one or more transistors or diodes.

Never remove or install transistors while the amplifier is turned on or you may damage some of the other transistors. Although transistors have almost unlimited life when they are used properly, they are much more vulnerable to damage than vacuum tubes. A vacuum tube, for instance, may be operated under shorted, zero-bias, excessive voltage, or high-current conditions for at least short periods of time without materially damaging the tube; but any one of these same conditions can completely destroy a transistor instantaneously.

THE CIRCUIT BREAKER

The components of your Guitar Amplifier are protected by a circuit breaker in the primary winding of the power transformer. If your amplifier should ever go completely dead and the power lamp goes out, the circuit breaker may have tripped due to an erratic line voltage or a faulty circuit in the Amplifier. Use the following procedure if you suspect the circuit breaker has tripped.

1. Turn the Power switch Off and push in on the red button of the circuit breaker and release it. Turn the Power switch On. If the Amplifier comes back on and remains in operation, the overload was most likely due to erratic line voltage.

2. If the amplifier comes back on and then goes off again, there is a short circuit somewhere that must be located before the unit will operate. Look for signs of overheated parts, bare wires touching each other or the chassis, or items 1, 3, 4, and 5 of the General Checks. After the trouble is corrected, press in on the red button of the circuit breaker and the amplifier should remain in operation.

SHIPPING INSTRUCTIONS

If the Amplifier is sent back to the Factory for repair, do not send the cabinet. The cabinet is not necessary for shipping and could be damaged enroute. Complete shipping instructions can be found in the Kit Builders Guide.

Troubleshooting Chart

DIFFICULTY	POSSIBLE CAUSE
No sound. POWER light does not light.	1. Circuit breaker tripped. See Circuit Breaker keeps tripping.
Circuit breaker keeps tripping.	1. Speaker wires shorted. 2. Diodes D501, D502, D503, D504, D505, or D506 shorted. 3. Capacitors C503 or C504 shorted. 4. Transistors Q12, Q13, Q14, Q15, or Q16 faulty.
No sound or noise. POWER lamp lights.	1. Speaker wires open or shorted. 2. Diodes D501, D502, D503, D504, D505, or D506 open. 3. Transistors Q10, Q11, Q12, Q13, Q14, Q15, or Q16 faulty.
Noise but no sound on any of the channels. Pilot lamp lights.	1. Transistors Q10 or Q11 faulty. 2. Cable between Amplifier and instrument faulty. 3. Diodes D505 or D506 faulty. 4. Capacitor C504, C505, C506, or C507 faulty. 5. Resistor R502, R503, or R504 faulty.
Distorted or dead Guitar channel. Other two channels OK.	1. Transistors Q1, Q2, or Q3 faulty. 2. Capacitors C1, C4, or C6 faulty. 3. Tone control network incorrectly wired.
Distorted or dead MIC-PHONO channel. Other two channels OK.	1. Transistors Q7, Q8, or Q9 faulty. 2. Excessive input levels. 3. Capacitors C201, C203, C204, or C209 faulty. 4. Switch on microphone in Off position. 5. Cables between record player or microphone and Amplifier faulty.
Distorted or dead BASS channel. Other two channels OK.	1. Transistors Q4, Q5, or Q6 faulty. 2. Capacitors C101 or C103 faulty. 3. Tone control network incorrectly wired.
No tremolo (foot switch not plugged in).	1. Transistors Q19, Q20, or Q21 faulty. 2. Diode D401 faulty. 3. R624 incorrectly wired.

DIFFICULTY	POSSIBLE CAUSE
No reverb (foot switch not plugged in).	1. Transistors Q17 or Q18 faulty. 2. Cables to reverb unit loose. 3. Coils on reverb unit broken, due to severe jar. 4. Resistor R622 incorrectly wired.
No reverb with foot switch plugged in.	1. Foot switch cable shorted. 2. REV switch on foot switch faulty.
No tremolo with foot switch plugged in.	1. Foot switch cable shorted. 2. TREM switch on foot switch faulty.
Distorted or weak sound on all channels.	1. Transistors Q10, Q11, Q12, Q13, Q14, Q15, or Q16 faulty. 2. Diodes D301 or D302 faulty. 3. Speakers out of phase. See Speakers section, Page 56. 4. Capacitors C503, C504, C505, C506, or C507 faulty.
Excessive hum with musical instrument connected.	1. POWER switch in wrong ON position. 2. Instrument faulty (if hum stops when instrument is unplugged). 3. Hum is being picked up by instrument from other nearby equipment. 4. Instrument cable faulty (open ground connection).
High hum with no inputs connected.	1. Capacitors C503, C506, or C507 faulty. 2. Diodes D501, D502, D503, D504, D505, or D506 faulty.
High hum with REVERB control turned up.	1. Cable to reverb faulty (open ground connection). 2. Capacitor C506 or C507 faulty. 3. Reverb unit not centered in compartment (touching chassis). 4. Hum is being picked up by instrument from other nearby equipment.

SPECIFICATIONS

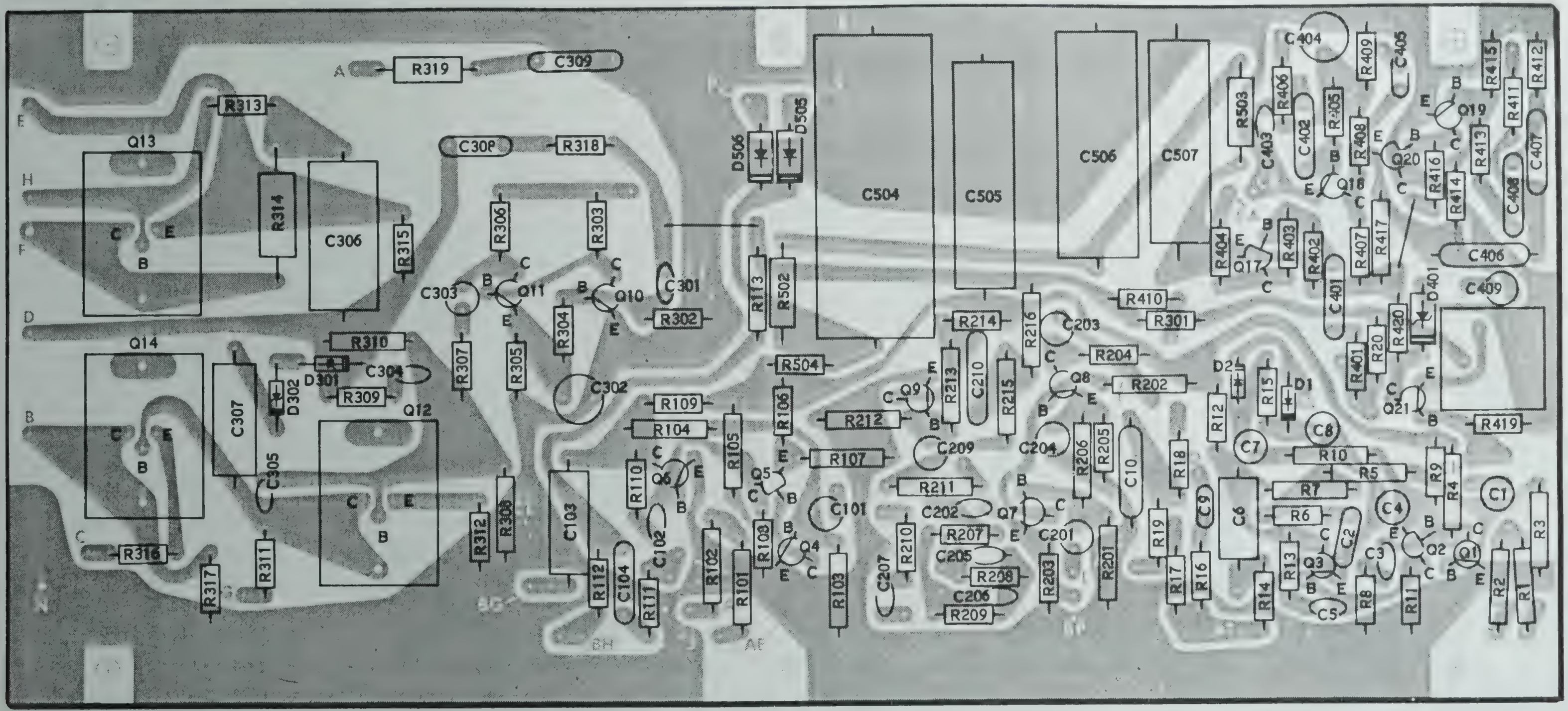
Continuous Power.	100 watts into a 4 Ω load. 70 watts into an 8 Ω load.
Music Power.	120 watts (240 watts peak) into a 4 Ω load*. 90 watts (180 watts peak) into an 8 Ω load*.
Music Reproduction Range.	40 Hz to 20 kHz.
Harmonic Distortion.	.5% or less at 80 watts into a 4 Ω load.
Intermodulation Distortion.	2% or less at 80 watts into a 4 Ω load. (Tone controls set for equal response at 60 Hz and 6 kHz.)
Hum and Noise**.	Guitar channel: -65 dB. Bass channel: -68 dB. Microphone input: -60 dB. Phono input: -60 dB.
Input Sensitivity***.	Guitar inputs: 50 mv at 200 Hz. Bass inputs: 55 mv at 200 Hz. Microphone input: 15 mv at 1 kHz. Phono input: 15 mv at 1 kHz.
Input Impedance.	Guitar inputs: 33 K ohms. Bass inputs: 39 K ohms. Microphone input: 40 K ohms. Phono input: 47 K ohms.
Reverberation Level.	Variable.
Reverberation Delay.	Long delay spring: .037 second. Short delay spring: .029 second.
Tremolo Speed.	Variable from 3.5 to 10 Hz.
Tremolo Depth.	Variable from 0 to approximately 75% amplitude modulation.

*EIA (Electronics Industries Association) music power rating standards.

**Measured with inputs open, gain at maximum, tone controls at center.

***For 20 volts output (100 watts into a 4 Ω load).

Transistor Complement	5 - 2N3391; low noise input amplifier. 5 - 2N3393; amplifier, oscillator, LDR driver. 4 - MPS6517; amplifier. 2 - 2N3859A; amplifier. 2 - 40409; predriver power amplifier driver. 1 - 40410; power amplifier driver. 2 - 40411; power amplifier outputs.
Diode Complement	2 - 1N191; harmonic modifier. 2 - 1N3754; temperature compensating. 1 - 13.5 V Zener; voltage regulator. 2 - 4.7 V Zener; short protection circuit. 2 - 750 ma silicon; power supply diodes. 4 - 3 ampere silicon; power amplifier supply diodes.
Circuit Breaker	Trips at 2.11 amperes.
AC Power Socket	120 VAC, 200 watts (unswitched).
Inputs	Guitar channel: 2 phone inputs. Bass channel: 2 phone inputs. Mic-Phono channel: 1 phone input, 1 phono input
Controls and Switches	
Guitar Channel	Volume control Bass control. Treble control. Tremolo Rate control. Tremolo Depth control. Reverb control. Brightness switch. H-M (Harmonic Modifier) switch.
Mic-Phono Channel	Volume control. Bass control. Treble control. Mic-Phono switch.
Bass Channel	Volume control. Tone control. Bass boost switch.
Line Reverse	ON-OFF-ON switch.



CIRCUIT BOARD X-RAY VIEW

(VIEWED FROM FOIL SIDE)

Power Requirements	105-125 volts or 210-250 volts; 50/60 Hz: 33 watts idling and 230 watts at full output.
Cabinet Material	1/2" thick pressed wood with black Lavant covering.
Cabinet Size	27-5/16" wide (including carrying handles) x 14-1/2" deep x 6-3/4" high.
Net Weight	36 pounds.
Accessory (Included With Amplifier)	Foot switch: Reverb ON-OFF; Tremolo ON-OFF.

The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

CIRCUIT DESCRIPTION

Refer to the Schematic Diagram (fold-out from Page 69) and the Block Diagram (fold-out from Page 64) while you read the Circuit Description.

The Amplifier is divided into seven sections which are illustrated by the dotted-in areas on the Schematic Diagram and Block Diagram. These sections are as follows: Guitar preamplifier, Bass preamplifier, Mic-Phono preamplifier, Power amplifier, Reverberation, Tremolo, and Power Supply. Each section will be described separately beginning with the Guitar Preamplifier.

To help you locate specific parts in the Amplifier, or on the Schematic, the resistors, capacitors, diodes, etc., are in the following groups:

1-99	Parts in the Guitar Preamplifier.
100-199	Parts in the Bass Preamplifier.
200-299	Parts in the Mic-Phono Preamplifier.
300-399	Parts in the Power Amplifier.
400-499	Parts in the Reverberation and Tremolo.
500-599	Parts in the Power Supply.
600-699	Parts on the chassis.

GUITAR PREAMPLIFIER

The signals from the Guitar input jacks are coupled through isolation resistors R1 and R2 to the arm of the first section of the dual Volume control, R601. Volume control R601 is situated at the Input jacks so it can control the amount of signal before it is amplified rather than after it is amplified. In this way, any strong signal from the instrument which could cause distortion in the preamplifier stages is eliminated.

Control R603 is the second part of the dual Volume control. As the control R601 is turned toward maximum resistance, control R603 approaches the minimum resistance position. Control R603 applies a negative feedback signal through resistor R602 to the input circuit of transistor Q1. The feedback increases as control R603 is turned toward the maximum resistance position. This negative feedback signal reduces the gain and thus the noise level, in the guitar preamplifier at low input signal levels.

The signal from lug 1 of Volume control R601 is coupled through capacitor C1 to the base of low-noise input amplifier, Q1. Q1 amplifies the signal

and couples it to the base of amplifier Q2 where it is further amplified and coupled to amplifier Q3. Capacitor C3, capacitor C5, resistor R13, and resistor R8 form high frequency attenuation networks which stabilize the preamplifier at frequencies above the audible listening range.

A negative feedback signal is coupled from the collector of Q3 to the base of input amplifier Q1 through a voltage divider network consisting of resistors R7, R5, and R3. This feedback signal reduces the distortion and stabilizes the gain of the preamplifier.

From the collector of Q3, the signal is coupled through capacitor C6 and resistor R14 to the H-M (harmonic modification) circuit and to the tone control network.

When the H-M (Harmonic Modifier) switch is turned On, the waveform modification network consisting of diodes D1 and D2, resistor R15, and capacitors C7 and C8 is switched into the circuit. This network modifies the waveforms by compressing or clipping the peaks and creating harmonics. Capacitors C7 and C8 charge through diodes D1 and D2 and discharge through resistor R15.

Only the high frequency components of the signal are coupled through capacitor C601 to lug 3 of the Treble control R606. Both the high and low frequency signals are coupled through resistors R17, R604, R605, and R18. From R18 however, the high frequency signal is bypassed through capacitor C10 to ground; allowing only the low frequency signal to proceed through resistor R19 to lug 1 of the Treble control.

The high frequency and low frequency signals are combined at lug 2 of the Treble control. The amount of each depends upon the Bass and Treble control settings. The signal is then coupled through resistors R20, R301 and capacitor C301 to the base of transistor Q10. This is the input stage of the power amplifier circuit, which will be described later.

When the Brightness switch is turned On, the tone control network is connected in parallel with the brightness network, which consists of R16 and C9. This boosts the midrange and high frequency portions of the signal.

BASS AMPLIFIER

Except for a few small differences, the bass preamplifier circuit is identical to the guitar preamplifier. Therefore, only these differences will be described here.

The negative feedback circuit from the collector of Q6 to the base of input amplifier Q4 only contains one resistor, R104, in this preamplifier (in the guitar preamplifier, a voltage divider network is used). Note also that the high frequency attenuator network is not needed at the base of Q5.

The Tone control regulates the amount of high and low frequencies which pass through the tone control network. The high frequency signal path is through capacitor C600, resistors R612, R111, and capacitor C104 to resistor R113.

The low frequency signal path is through capacitor C600 and resistors R610 and R112. Capacitor C602 bypasses the high frequencies to ground. When the Tone control is turned clockwise, the high frequency signal is decreased. When the Tone control is turned counterclockwise, the low frequency signal is decreased.

The high and low frequency signals are combined at R113 and coupled through capacitor C301 to the base of amplifier Q10. When the Bass Boost switch is turned On, capacitor C600 is shorted out, which increases the bass.

MIC-PHONO PREAMPLIFIER

The signal from the Mic jack or Phono socket is selected by the Mic-Phono switch and coupled through C201 to the base of low-noise input amplifier Q7. Q7 amplifies the signal and couples it to the base of another amplifier, Q8. A DC negative feedback signal is coupled through R206 from the emitter of Q8 to the base of Q7.

From the collector of Q8, the output signal is coupled to the Volume control R614 through capacitor C203. A portion of the signal is coupled through the feedback equalization network and the Mic-Phono switch to the emitter circuit of Q7. When the Mic-Phono switch is in the Mic position, resistor R207 and capacitor C202 are connected

in the circuit to provide a flat frequency response. When this switch is in the Phono position, resistor R208, R209, and capacitors C205, C206 are connected in the circuit to produce a de-emphasis characteristic which corresponds to the RIAA phonograph equalization curve.

From lug 2 of the Volume control, the signal is coupled to the tone control network. Only the high frequency components of signal are coupled through capacitor C207 and resistor R210 to the Treble Control R619. Both the high and low frequency signals are coupled through resistor R615 to the Bass control. The high frequency signals at the Bass control are bypassed through capacitor C208 to ground, allowing only the low frequency signals to proceed through R618.

The signal from the tone control network is coupled through resistor R211 and capacitor C209 to the base of amplifier Q9. The collector signal is fed back to the base of Q9 by two paths. The path through resistor R213 supplies both AC and DC feedback to stabilize the operation of Q9. The other path supplies only AC feedback through capacitor C210 and resistor R215 to stabilize gain and minimize distortion.

The output signal from Q9 is fed through capacitor C210 and resistor R216 to the power amplifier.

POWER AMPLIFIER

The input signals from the preamplifier circuits are coupled through capacitor C301 to the base of transistor Q10. Q10 and Q11 are direct coupled amplifiers. The amplified signal from the collector of Q11 is coupled through C303 and R307 to predriver transistor Q12 where it is again amplified.

The signal from the collector of Q12 is direct coupled to the base of Q14, and through resistor R311 and diodes D601 and D602 to the base of Q13. The forward voltage drop across these diodes and resistor provides the bias voltage needed to operate the driver and output stages in class AB. These two diodes are mounted on the heat sinks of the output transistors to provide thermal stability.

Driver transistors Q13 and Q14, and output transistors Q15 and Q16, form a quasi-complementary output circuit. In this circuit, a positive-going signal applied to the base of Q13 causes the transistor to conduct. This in turn causes Q15 to conduct, charging capacitor C604 through the voice coils of the speakers. When the signal goes negative, Q13 and then Q15 will be cut off. This negative going signal causes Q14 and Q16 to conduct, discharging capacitor C604 back through the voice coils of the speakers. The charging and discharging of capacitor C604 through the voice coils causes the speaker cones to move in and out, converting the electrical signal back to sound.

The overall AC feedback for wide frequency response of the power amplifier is provided by capacitor C308 and resistor R318, from the output to the base of transistor Q10.

A current-limiting circuit provides short circuit protection. This circuit includes zener diodes D301 and D302, emitter resistors R620 and R621, and capacitor C307. If a short circuit or severe overload should cause a current of more than 7 amperes to flow through either emitter resistor, the respective zener diode would conduct and clamp the driver voltage to a level that would prevent further increase in output current.

Choke L601, resistor R319, and capacitor C309 stabilize the amplifier for various output loads.

THE REVERBERATION CIRCUITS

The input signal for the reverberation circuitry is obtained from the Treble control in the guitar preamplifier channel. This signal is coupled through resistor R401 and capacitor C401 to the base of amplifier transistor Q17. From the collector of Q17, the signal is coupled through R404 to the reverberation unit, which consists of two transducers and two delay springs. The input transducer changes the electrical signal into physical motion, which is delayed slightly as it travels down the springs to the output transducer. The output transducer changes the physical motion back into an electrical signal, which is coupled to the base of transistor Q18. The signal at this point is essentially the same as the input signal, except that it is delayed slightly.

After the delayed signal is amplified by transistor Q18, it is coupled through capacitor C405 to lug 3 of the Reverb control. The setting of the Reverb control determines how much of this delayed signal is coupled through resistor R410 and capacitor C301 to the power amplifier.

The base of transistor Q18 is connected through resistors R405 and R406, to a foot switch. When the foot switch is open or unplugged, transistor Q18 amplifies normally. When the foot switch is closed, the base bias of transistor Q18 is shorted to ground, cutting off the transistor and, thus, stopping the signal.

TREMOLO CIRCUIT

The signal from the guitar preamplifier is applied across the resistance element of the LDR (Light Dependant Resistor). The LDR is, in effect, the output element of the tremolo circuit, which operates as follows:

Tremolo oscillator transistors Q19 and Q20 are connected in a subsonic, phase-shift oscillator circuit. This circuit develops a signal that can be varied from approximately 3-1/2 to 10 Hz by the Rate control in the phase-shift network. The amplitude of the oscillator signal from the emitter of Q20 is varied by the Depth control. The signal is then coupled to the base of LDR driver transistor Q21.

The LDR unit consists of a low-current lamp and a light-dependent resistance element. The resistance value of the resistance element depends upon the brightness of the lamp: As the lamp glows brighter, the resistance decreases; as the lamp glows dimmer, the resistance increases.

When the Depth control is turned clockwise from its full counterclockwise position, the amplitude of the oscillator signal increases and this causes transistor Q21 to conduct on the positive portion of the signal. When Q21 conducts, it draws emitter current through the lamp element in the LDR unit, causing the lamp to turn on and off with the oscillator signal. Zener diode D401 supplies a regulated 13.5 volts for transistor Q21.

Because the brightness of the lamp varies in accordance with rate and depth of the tremolo signal, the resistance of the LDR will also vary in the same manner, from a very low resistance (practically a short circuit) to a very high resistance (practically an open circuit). Since the LDR is connected between the reverb channel signal path and ground, its resistance variations will modulate the reverb channel signal with the low-frequency tremolo signal.

The tremolo circuit can be turned on and off with the foot switch, which, in the OFF position, shorts the base of LDR driver transistor Q21 to ground. The tremolo circuit is on when the foot switch is unplugged.

POWER SUPPLY

The AC input from the power line is connected through the line-reversing On-Off switch and through the circuit breaker to power transformer T1. In addition to turning the Guitar Amplifier on and off, the line-reversing switch permits connecting either side of the power line to the chassis through capacitor C501; this is useful in reducing stray hum pickup from the musical instrument. The circuit breaker protects the Guitar Amplifier circuitry under overload conditions.

The power transformer has two primary windings. These two windings may be connected in parallel for a 120 volt line input, or they may be connected in series for a 240 volt line input.

One secondary winding of the transformer is connected to a full-wave bridge rectifier circuit that consists of diodes D501, D502, D503, and D504. The output of this circuit is filtered by capacitor C503. 80 volts is supplied from this point to the power amplifier circuits. Resistor R501 is a bleeder resistor that discharges capacitor C503 after the Amplifier is turned Off.

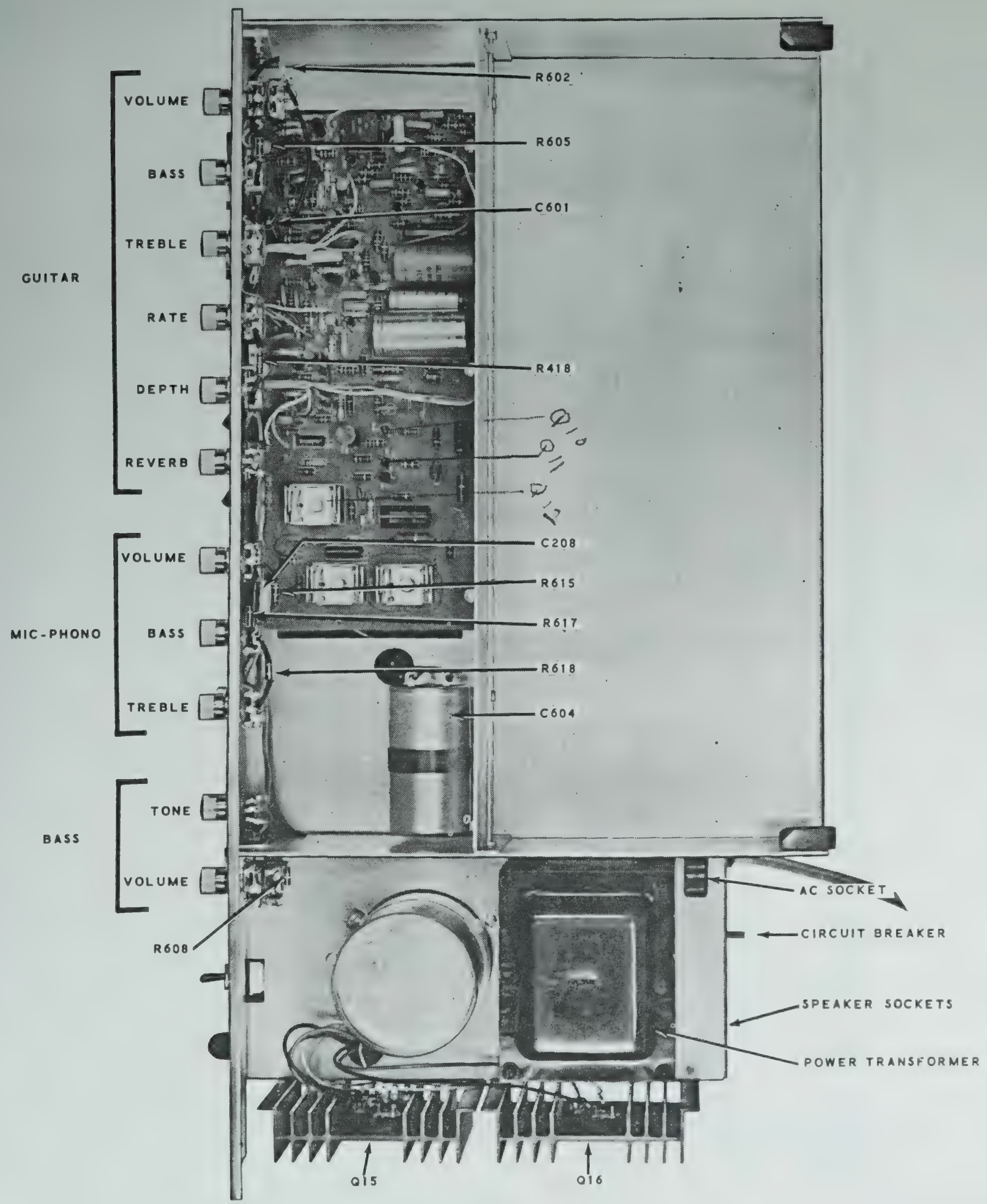
Another secondary winding of T1 is connected to a full-wave rectifier circuit consisting of diodes D505 and D506. The output from this circuit is filtered by capacitors C504 and C505 and resistor R504. +60 volts is supplied from this point to the preamplifier circuits.

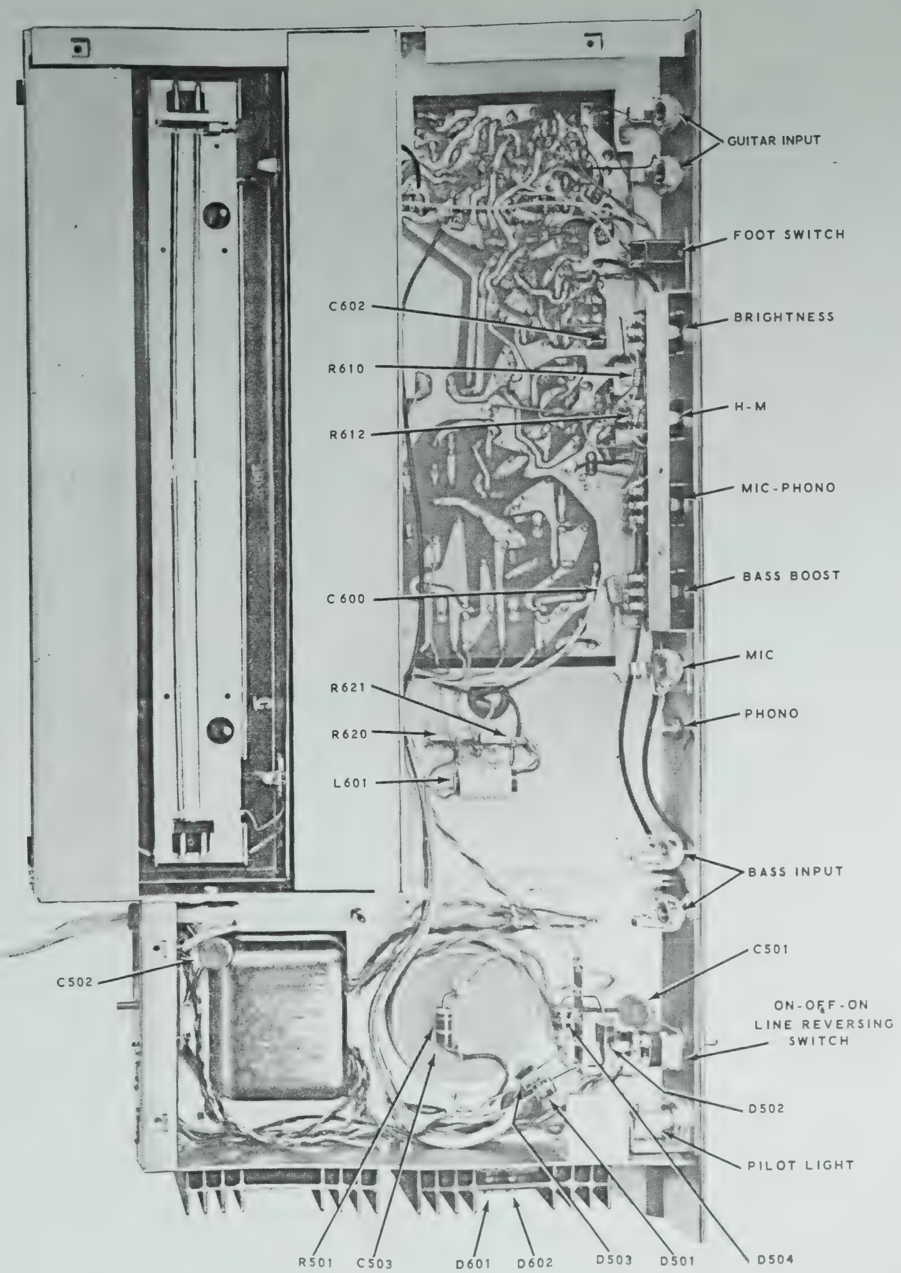
The output from this rectifier circuit is also filtered by capacitors C506 and C507 and resistors R502 and R503. +25 volts is supplied from this filter to the reverb, tremolo, and power amplifier circuits.

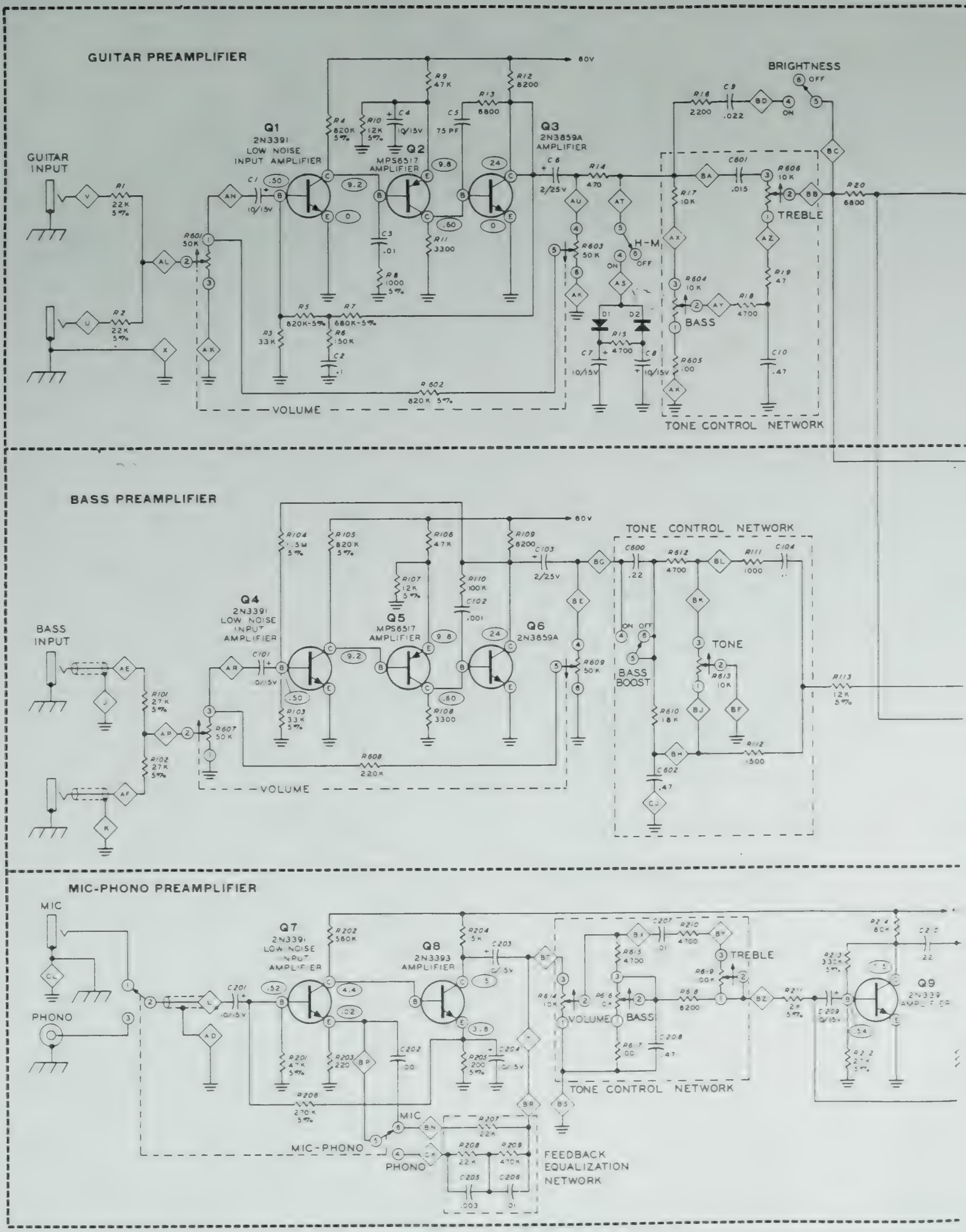
A third secondary winding supplies voltage for the Power Lamp.

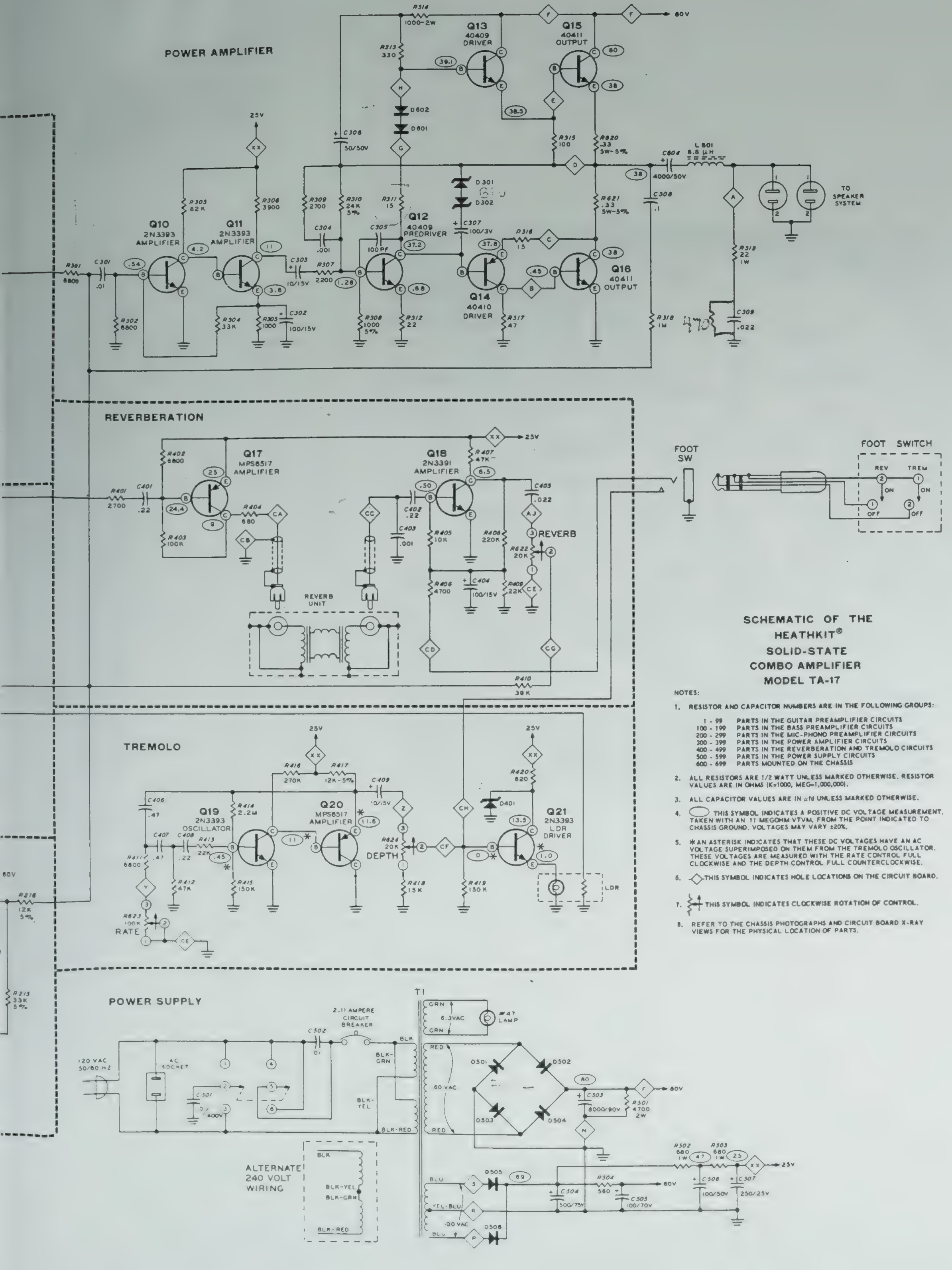
CHASSIS PHOTOGRAPHS

TOP VIEW




GUITAR INPUT
FOOT SWITCH
C602
BRIGHTNESS
R610
H-M
R612
MIC-PHONO
BASS BOOST
C600
MIC
R621
PHONO
R620
L601
BASS INPUT
C501
C502
ON-OFF-ON
LINE REVERSING
SWITCH
D502
PILOT LIGHT
R501
C503
D601
D602
D503
D501
D504


GUITAR PREAMPLIFIER
GUITAR INPUT
Q1
2N3391
LOW NOISE INPUT AMPLIFIER
Q2
MPS6517
AMPLIFIER
Q3
2N3859A
AMPLIFIER
60V
VOLUME
H-M
ON
OFF
BRIGHTNESS
TREBLE
BASS
TONE CONTROL NETWORK
BASS PREAMPLIFIER
BASS INPUT
Q4
2N3391
LOW NOISE INPUT AMPLIFIER
Q5
MPS6517
AMPLIFIER
Q6
2N3859A
VOLUME
TONE CONTROL NETWORK
BASS BOOST
TONE
MIC-PHONO PREAMPLIFIER
MIC
PHONO
Q7
2N3391
LOW NOISE INPUT AMPLIFIER
Q8
2N3393
AMPLIFIER
Q9
VOLUME
BASS
TREBLE
TONE CONTROL NETWORK
MIC
MIC-PHONO
PHONO
FEEDBACK EQUALIZATION NETWORK



SCHEMATIC OF THE HEATHKIT® SOLID-STATE COMBO AMPLIFIER MODEL TA-17

NOTES:

1. RESISTOR AND CAPACITOR NUMBERS ARE IN THE FOLLOWING GROUPS:

1 - 99	PARTS IN THE GUITAR PREAMPLIFIER CIRCUITS
100 - 199	PARTS IN THE BASS PREAMPLIFIER CIRCUITS
200 - 299	PARTS IN THE MIC-PHONO PREAMPLIFIER CIRCUITS
300 - 399	PARTS IN THE POWER AMPLIFIER CIRCUITS
400 - 499	PARTS IN THE REVERBERATION AND TREMOLO CIRCUITS
500 - 599	PARTS IN THE POWER SUPPLY CIRCUITS
600 - 699	PARTS MOUNTED ON THE CHASSIS

2. ALL RESISTORS ARE 1/2 WATT UNLESS MARKED OTHERWISE. RESISTOR VALUES ARE IN OHMS (K=1000, MEG=1,000,000).

3. ALL CAPACITOR VALUES ARE IN µfd UNLESS MARKED OTHERWISE.

4. ⬭ THIS SYMBOL INDICATES A POSITIVE DC VOLTAGE MEASUREMENT, TAKEN WITH AN 11 MEGOHM VTVM, FROM THE POINT INDICATED TO CHASSIS GROUND. VOLTAGES MAY VARY ±20%.

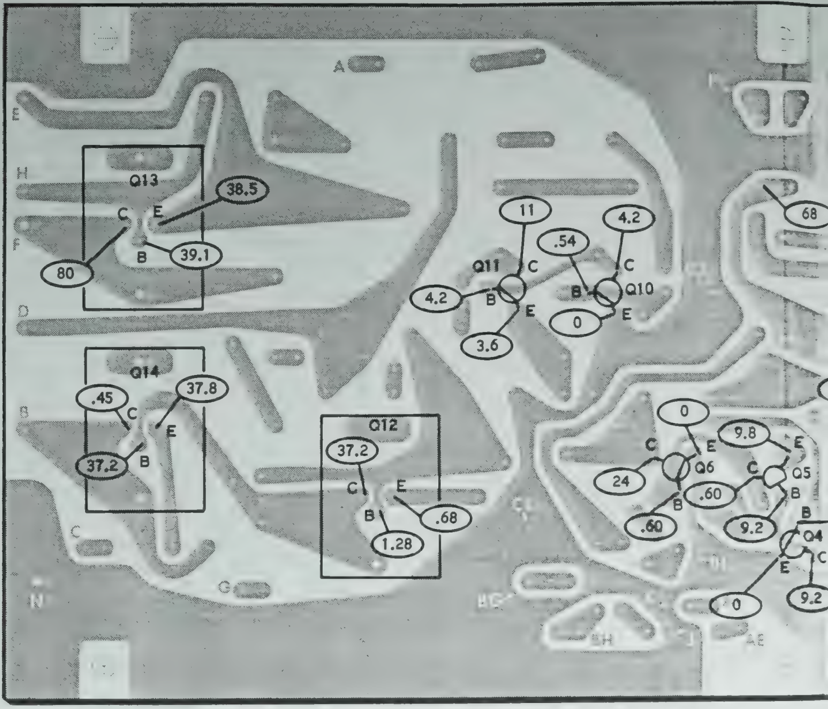
5. * AN ASTERISK INDICATES THAT THESE DC VOLTAGES HAVE AN AC VOLTAGE SUPERIMPOSED ON THEM FROM THE TREMOLO OSCILLATOR. THESE VOLTAGES ARE MEASURED WITH THE RATE CONTROL FULL CLOCKWISE AND THE DEPTH CONTROL FULL COUNTERCLOCKWISE.

6. ◇ THIS SYMBOL INDICATES HOLE LOCATIONS ON THE CIRCUIT BOARD.

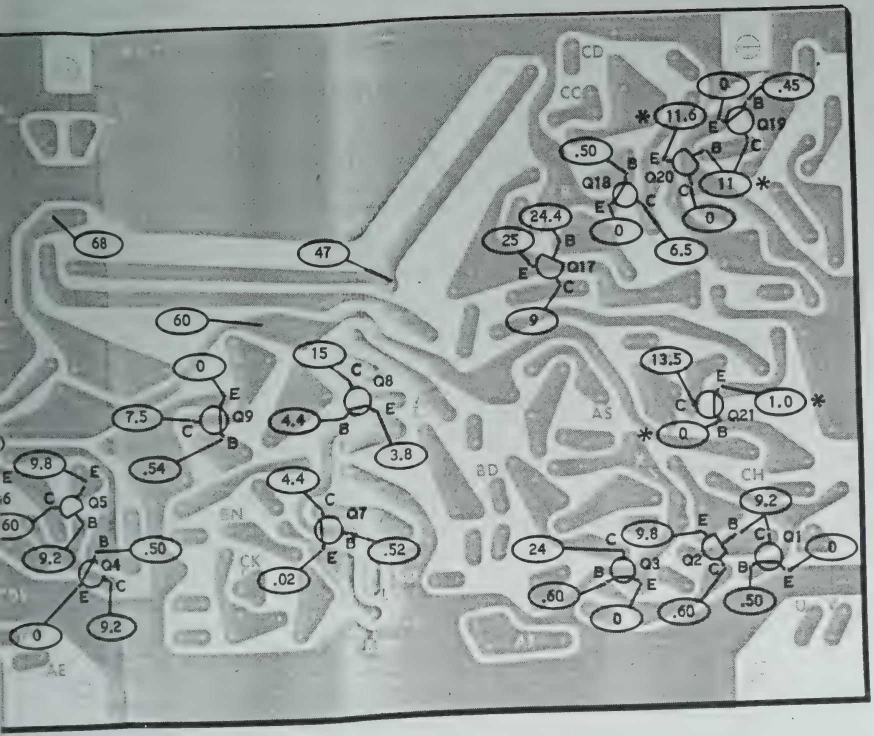
7. THIS SYMBOL INDICATES CLOCKWISE ROTATION OF CONTROL.

8. REFER TO THE CHASSIS PHOTOGRAPHS AND CIRCUIT BOARD X-RAY VIEWS FOR THE PHYSICAL LOCATION OF PARTS.

Pa


A
E
H
F
D
B
C
N
G
Q13
C
E
B
38.5
39.1
80
Q14
.45
C
37.8
E
37.2
B
Q12
37.2
C
E
B
.68
1.28
11
4.2
.54
Q11
C
4.2
B
E
3.6
B
Q10
C
E
0
68
0
C
E
9.8
E
Q6
24
C
Q5
.60
B
B
.60
9.2
B
Q4
E
C
0
9.2

VOLTAGE



* AN ASTERISK INDICATES THAT THESE DC VOLTAGES HAVE AN AC VOLTAGE SUPERIMPOSED ON THEM FROM THE TREMOLO OSCILLATOR. THESE VOLTAGES ARE MEASURED WITH THE RATE CONTROL FULL CLOCKWISE AND THE DEPTH CONTROL FULL COUNTERCLOCKWISE.

LTAGE CHART

REPLACEMENT PARTS PRICE LIST

RESISTORS

1/2 Watt

PART No.	PRICE Each	DESCRIPTION
1-54	.10	15 Ω 5% ✓1 —
1-49	.10	22 Ω
1-1	.10	47 Ω
1-3	.10	100 Ω
1-45	.10	220 Ω
1-4	.10	330 Ω
1-6	.10	470 Ω
1-119	.10	560 Ω
1-7	.10	680 Ω
1-8	.10	820 Ω
1-9	.10	1000 Ω
1-80	.15	1200 Ω 5%
1-11	.10	1500 Ω
1-44	.10	2200 Ω
1-13	.10	2700 Ω
1-14	.10	3300 Ω
1-46	.10	3900 Ω
1-16	.10	4700 Ω
1-19	.10	6800 Ω
1-73	.10	8200 Ω
1-20	.10	10 KΩ
1-21	.10	15 KΩ
1-69	.10	18 KΩ
1-22	.10	22 KΩ
1-24	.10	33 KΩ
1-67	.10	39 KΩ
1-25	.10	47 KΩ
1-102	.10	82 KΩ
1-26	.10	100 KΩ
1-27	.10	150 KΩ
1-126	.10	180 KΩ
1-29	.10	220 KΩ
1-30	.10	270 KΩ
1-33	.10	470 KΩ
1-35	.10	1 megohm
1-37	.10	2.2 megohm

1/2 Watt 5% Low-Noise

PART No.	PRICE Each	DESCRIPTION
4-15	.10	1000 Ω
4-39	.10	12 KΩ
4-23	.10	22 KΩ
4-24	.10	24 KΩ
4-25	.10	27 KΩ
4-26	.10	33 KΩ
4-27	.10	47 KΩ
4-30	.10	270 KΩ
4-31	.10	330 KΩ
4-49	.10	560 KΩ
4-50	.10	680 KΩ
4-51	.10	820 KΩ
4-46	.10	1.5 megohm

1 Watt

PART No.	PRICE Each	DESCRIPTION
1-13-1	.10	22 Ω
1-1-1	.10	470 Ω
1-21-1	.10	680 Ω

2 Watt

PART No.	PRICE Each	DESCRIPTION
1-15-2	.20	1000 Ω
1-2-2	.20	4700 Ω

5 Watt

PART No.	PRICE Each	DESCRIPTION
3-11-5	.15	.33 Ω wire-wound

CAPACITORS

Disc

PART No.	PRICE Each	DESCRIPTION
21-54	.10	75 pf
21-75	.10	100 pf
21-14	.10	.001 μfd
21-26	.10	.003 μfd
21-47	.15	.01 μfd, 50 V
21-70	.20	.01 μfd, 1.4 KV

Resin

PART No.	PRICE Each	DESCRIPTION
27-63	.10	.022 μfd, 50 V
27-27	.15	.022 μfd, 400 V
27-47	.20	.1 μfd or .1 K
27-60	.25	.22 (0.22) μfd
27-61	.45	.47 μfd

Tubular

PART No.	PRICE Each	DESCRIPTION
23-42	.15	.015 μfd

Electrolytic

PART No.	PRICE Each	DESCRIPTION
25-123	.40	2 μfd, 25 V
25-115	.45	10 μfd, 15 V
25-126	.75	50 μfd, 50 V
25-117	.60	100 μfd, 15 V
25-153	.40	100 μfd, 3 V
25-28	.70	100 μfd, 50 V
25-172	.80	100 μfd, 70 V
25-131	.90	250 μfd, 25 V
25-173	1.70	500 μfd, 75 V
25-156	4.15	4000 μfd, 50 V
25-171	8.00	8000 μfd, 90 V

DIODES

PART No.	PRICE Each	DESCRIPTION
56-26	.30	1N191 crystal
56-32	1.50	Zener, 13.5 V
56-44	1.15	Zener, 4.7 V ✓
56-33	.55	1N3754, temperature compensating
57-27	.60	Silicon, 750 ma
57-42	1.15	Silicon, 3 ampere

TRANSISTORS

PART No.	PRICE Each	DESCRIPTION
417-132	.70	MPS 6517
417-91	1.10	2N3391
417-118	.55	2 2N3393 ✓
417-135	.90	2 2N3859A
417-137	2.10	2 40409 ✓
417-138	3.00	40410
417-139	6.80	40411 burned out

CONTROLS-SWITCHES

PART No.	PRICE Each	DESCRIPTION
10-8	.50	10 KΩ control
10-110	.55	10 KΩ control
10-10	.50	20 KΩ control
10-40	.50	100 KΩ control
12-85	1.55	50 KΩ dual control
60-32	.60	Rocker switch
64-25	1.30	Pushbutton switch
61-12	1.55	3-position toggle switch

TERMINAL STRIPS

PART No.	PRICE Each	DESCRIPTION
431-1	.10	2-lug terminal
431-43	.10	3-lug large
431-39	.15	5-lug miniature
431-42	.10	5-lug large
431-45	.10	6-lug

INSULATORS

PART No.	PRICE Each	DESCRIPTION
73-4	.10	5/16" rubber grommet
73-1	.10	3/8" rubber grommet
73-2	.10	3/4" rubber grommet
75-71	.10	Strain relief (small slot)
75-30	.10	Strain relief (large slot)
75-85	.10	Nylon spacer
75-60	.10	Mica insulator
73-50	.20	Plastic sponge strip
73-49	.15	Rubber pad
333-5	.10	Extended plastic edge molding

PLUGS-SOCKETS-JACKS

PART No.	PRICE Each	DESCRIPTION
438-4	.10	Phono plug
438-27	1.10	Phone plug
432-29	1.20	Speaker plug
432-32	.45	Speaker socket
434-107	.25	Phono socket
434-175	.45	Lamp socket
434-117	.25	Transistor socket
434-147	.20	AC socket
436-20	.45	2-lug phone jack
436-27	.50	3-lug phone jack

GENERAL

PART No.	PRICE Each	DESCRIPTION
9-18	4.25	Light sensitive resistor
45-59	.60	8.8 μH choke
65-11	.60	2.11 ampere circuit breaker
412-1	.15	#47 lamp
462-262	.90	Knob

WIRE-CABLE-SLEEVING

PART No.	PRICE Each	DESCRIPTION
134-168	3.30	Control cable assembly
134-169	2.15	Amplifier-power supply cable assembly
344-15	.05/ft	Black stranded wire
344-16	.05/ft	Red stranded wire
344-50	.05/ft	Black hookup wire
344-51	.05/ft	Brown hookup wire
344-52	.05/ft	Red hookup wire
344-53	.05/ft	Orange hookup wire
344-54	.05/ft	Yellow hookup wire
344-55	.05/ft	Green hookup wire
344-56	.05/ft	Blue hookup wire
344-57	.05/ft	Violet hookup wire
344-58	.05/ft	Gray hookup wire
344-59	.05/ft	White hookup wire
346-1	.05/ft	Sleeving
343-7	.05/ft	1-lead shielded cable
347-35	.10/ft	2-lead shielded cable
89-33	.75	Line cord

HARDWARE

#2 Hardware

PART No.	PRICE Each	DESCRIPTION
250-212	.05	2-56 x 3/16" self-tapping screw

#4 Hardware

PART No.	PRICE Each	DESCRIPTION
250-4	.05	4-40 x 3/8" roundhead screw
250-52	.05	4-40 x 1/4" screw
252-2	.05	4-40 nut
254-9	.05	#4 lockwasher

PART No.	PRICE Each	DESCRIPTION
#6 Hardware		
250-56	.05	6-32 x 1/4" screw
250-89	.05	6-32 x 3/8" screw
250-26	.05	6-32 x 5/8" screw
250-298	.05	6-32 x 3/4" self-tapping screw
250-8	.05	#6 x 3/8" sheet metal screw
252-3	.05	6-32 nut
254-1	.05	#6 lockwasher
#8 Hardware		
250-15	.05	8-32 x 1/8" setscrew
250-97	.05	8-32 x 1" truss head screw
252-4	.05	8-32 nut
252-92	.10	8-32 self-retaining nut
254-2	.05	#8 lockwasher
253-45	.05	#8 flat washer
Other Hardware		
252-7	.05	Control nut
254-14	.05	1/4" lockwasher (inside diameter)
253-10	.05	3/8" control flat washer
253-30	.05	1/2" flat washer (inside diameter)
254-4	.05	Large control lockwasher
254-5	.05	Small control lockwasher
432-67	.10	Wire nut
METAL PARTS		
200-498	1.80	Power supply chassis
200-499	1.70	Amplifier chassis
203-496	5.00	Front panel
203-495	1.25	Center panel
202-65	.90	Right panel
202-66	.90	Left panel
202-67	.65	Rear panel

PART No.	PRICE Each	DESCRIPTION
Metal Parts (cont'd.)		
214-61	1.35	Reverberation panel
204-790	.45	Switch bracket
206-353	.20	Input shield
204-789	.10	Front panel support bracket
204-791	.10	Chassis support bracket
207-56	.55	Capacitor mounting clamp
100-589	.15	Capacitor mounting strap
214-46-1	1.40	Foot switch housing
205-536-1	.15	Foot switch plate
215-23	1.90	Transistor heat sink
MISCELLANEOUS		
91-163	14.85	Guitar amplifier cabinet with two clips and two screws in an envelope stapled to the back cover.
150-10	11.00	Reverberation unit
85-188-1	3.00	Circuit board
54-181	13.00	Power transformer
331-6	.10	Solder
352-13	.15	Silicone grease
390-183	.10	Foot switch label
490-5	.10	Nut starter
595-903	2.00	Manual

The above prices apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Selling prices elsewhere in U.S.A. may be slightly higher to offset transportation and local taxes. Outside the U.S.A. parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties and rates of exchange.

instruction sheet

FOR THE

HEATHKIT

GUITAR AMPLIFIER

Model TAM-17-1

To improve the circuit in the TA-17 Guitar Amplifier, a 470 Ω 2 watt resistor should be connected across capacitor C309.

Perform the following steps to complete the modification.

(✓) Remove the amplifier chassis from the cabinet to gain access to the circuit board.

(✓) Refer to Figure 1 below and locate capacitor C309 (.022 µF 400V).

(✓) Unsolder and remove C309 from the circuit board and discard it.

(✓) Prepare a resistor-capacitor combination as shown. Use the .022 µF 400V capacitor and 470 Ω (yellow-violet-brown) 2 watt resistor supplied.

(✓) Install the resistor-capacitor combination on the circuit board at the former location of C309, as shown in Figure 2. Solder the leads to the foil and cut off the excess lead lengths.

(✓) Reinstall the amplifier chassis in the cabinet.

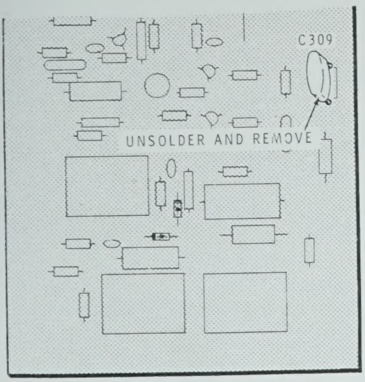
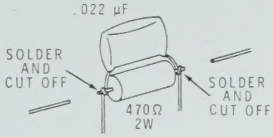


Figure 1



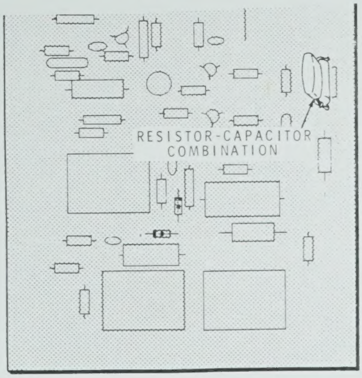


Figure 2

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